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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE
(DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER CASM118912		
U.S. APPLICATION NO. (if known see 37 C.F.R. 1.5)		
INTERNATIONAL APPLICATION NO PCT/AU00/01186	INTERNATIONAL FILING DATE 28 September 2000	PRIORITY DATE CLAIMED 28 September 1999
TITLE OF INVENTION IMPROVED SECURITY SYSTEM		
APPLICANT(S) FOR DO/EO/US David Paul JANKOWSKI, Leonard John KERRY, and Campbell Richard JAMES		

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information by **Express Mail**:

- X 1. This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 37 U.S.C. 371.
- X 3. This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
- X 4. The U.S. has been elected by the expiration of 19 months from the priority date (PCT Article 31).
- X 5. A copy of the International Application as filed (35 U.S.C. 371(c)(2))
- a. is attached hereto (required only if not communicated by the International Bureau).
- X b. has been communicated by the International Bureau.
- c. is not required, as the application was filed in the United States Receiving Office (RO/US).
6. An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).

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- _____ 7. Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
- _____ a. are attached hereto (required only if not communicated by the International Bureau).
- _____ b. have been communicated by the International Bureau.
- _____ c. have not been made; however, the time limit for making such amendments has NOT expired.
- _____ d. have not been made and will not be made.
- _____ 8. An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
- _____ 9. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
- _____ 10. An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 20. below concern document(s) or information included:

- _____ 11. An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98.
- _____ 12. An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included.
- X 13. A FIRST preliminary amendment.
- _____ 14. A SECOND or SUBSEQUENT preliminary amendment.
- _____ 15. A substitute specification.
- _____ 16. A change of power of attorney and/or address letter.
- _____ 17. A computer-readable form of the sequence listing in accordance with 35 U.S.C. 1.821 – 1.825.
- X 18. A second copy of the published international application under 35 U.S.C. 154(d)(4).
- _____ 19. A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
- _____ 20. Other items or information:

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<u>X</u> 21. The following fees are submitted:				CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1,040 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO.... \$890 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....\$740 International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)..... \$710 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$1,040	
Surcharge of \$130 for furnishing the oath or declaration later than ____ 20 30 months from the earliest claimed priority date (37 CFR 1.492(e))				\$-	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	18 - 20 =	0	X \$18	\$-	
Independent claims	2 - 3 =	0	X \$84	\$-	
MULTIPLE DEPENDENT CLAIMS(S) (if applicable)			+ \$280	\$280	
TOTAL OF ABOVE CALCULATIONS =				\$1,320	
____ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$-	
SUBTOTAL =				\$1,320	
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TOTAL NATIONAL FEE =				\$1,320	
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- X a. A check in the amount of \$1,320 covering the above fees is enclosed. Check No. 137295.
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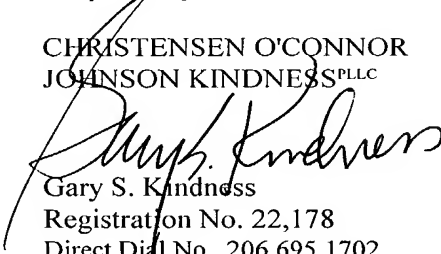
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Respectfully submitted,

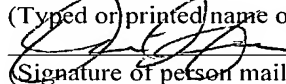
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EXPRESS MAIL CERTIFICATE

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Date of Deposit March 28, 2002

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: David Paul JANKOWSKI, Leonard John
KERRY, and Campbell Richard JAMES

Attorney Docket No. CASM118912

Int'l Application No: PCT/AU00/01186

Int'l Filing Date: 28 Sept. 2000

U.S. Application Serial No:

Priority Date Claimed: 28 Sept. 1999

Filed: Concurrently Herewith

Examiner:

Title: IMPROVED SECURITY SYSTEM

PRELIMINARY AMENDMENT

TO THE COMMISSIONER FOR PATENTS:

Please enter the following Preliminary Amendment for the above-identified patent application, which is the contemporaneously filed United States national application corresponding to International application No. PCT/AU00/01186, as follows:

In the Specification:

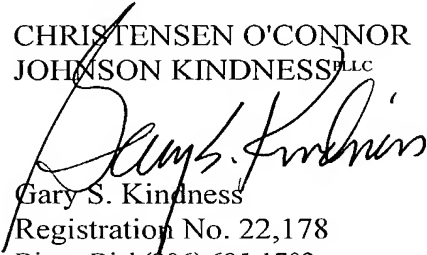
Amend the specification by inserting the following after the title: --This is a United States national stage application of International application No. PCT/AU00/01186, filed September 28, 2000, the benefit of the filing date of which is hereby claimed under 35 U.S.C. § 120, which in turn claims the benefit of Australian application No. PQ 3123, filed September 28, 1999, the benefit of the filing date of which is hereby claimed under 35 U.S.C. § 119.--.

REMARKS

If there are any questions, the Examiner is invited to telephone applicants' attorney at the number listed below.

Respectfully submitted,

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IMPROVED SECURITY SYSTEMField of the Invention

This invention relates to an improved security system and relates particularly to a security system which permits authorised keyless actuation of a locking system, a control system, or the like, to permit entry through or past a closure, such as a door, into a building, secure area or motor vehicle, or actuation of control circuits permitting operation of a motor vehicle or the like.

Background of the Invention

10 The invention will be described with particular reference to its application to a motor vehicle, but it will be understood that the principles of the invention apply to a wide range of applications.

Many forms of security systems have been proposed for motor vehicles which enable an authorised person to obtain access to the vehicle without the use of a key to physically unlock the vehicle doors. Such known systems include the provision of radio transmitter devices which, on actuation by a push button, cause the vehicle to unlock. These systems require the relatively bulky radio transmitter to be carried by the authorised person. Other systems, commonly known as "passive access" systems, enable an electronic identification device carried by an authorised person to actuate the locking mechanism of a locked vehicle. With such a system, the vehicle transmits a message to the electronic identification device when the person touches the vehicle door handle or triggers a short range proximity sensor in the vehicle. Typically, the message contains vehicle identification information so that the electronic identification device can determine whether or not to respond. The vehicle transmission may also contain a random number. If the vehicle identification code is correct, the random number is manipulated by the electronic identification device according to an algorithm. The result of the

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manipulation is then transmitted to the vehicle which compares the response to an expected response. If the transmitted response and expected response match, the vehicle is unlocked.

5 The system may also include vehicle operation authentication whereby a similar process is repeated when the vehicle operator attempts to start the vehicle.

10 In this instance, it is desirable for the system to be able to determine whether or not the identification device is inside the vehicle. Therefore, typically, the vehicle's signal transmission is controlled so that it is unlikely that the identification device could detect the signal from outside the vehicle.

15 The known passive access system described above provides a remote keyless entry system which allows authorised entry to and operation of a vehicle by an authorised person, carrying the electronic identification device, simply walking up to the vehicle, opening the door and driving off. However, the system is vulnerable to an unauthorised person obtaining access to the vehicle. An attack on the security takes advantage of the contactless operation of the electronic identification device and the ability to activate that device remotely without the knowledge of the authorised owner. The attack works as follows:

20 The authorised owner of the vehicle locks the vehicle and walks away, beyond the normal range of communication between the electronic identification device and the vehicle communication system. A person carrying a transceiver follows the operator. Another person carrying a second transceiver stays with the vehicle. The person near the vehicle triggers the vehicle to transmit its
25 identification message, such as by touching the door handle or triggering a proximity sensor in the vehicle. The transceiver carried by that person relays the vehicle's transmission to the transceiver of

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the second person near the authorised operator. The electronic identification device carried by the authorised operator receives the relayed vehicle transmission and responds. This response is received by the transceiver carried by the person near the owner and the response is relayed back to the transceiver carried by the person near the vehicle which transmits the identification device response and the vehicle, receiving a valid response, unlocks the vehicle.

While proposals have been made to resolve the potential security problem, such proposals are relatively expensive and difficult to implement.

One such proposal requires a further parameter to be determined, such as the distance between the vehicle and the electronic identification device, and the system is arranged so that the vehicle will only unlock if that distance is no greater than a predetermined maximum. While this additional proximity criteria is effective in most circumstances, it is a technically difficult and relatively expensive solution.

It is therefore desirable to provide an improved passive access security system which obviates the difficulties of the known system.

It is also desirable to provide an improved passive access security system which is relatively simple and economic to implement.

It is also desirable to provide an improved passive access security system which is robust and immune to attack using easily available, portable equipment such as transceivers.

Summary of the Invention

In accordance with one aspect of the invention there is provided a security system having transponder means adapted to be actuated to generate and transmit an electromagnetic trigger signal, and a portable electronic device

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adapted to receive and respond to said trigger signal by transmitting a response signal, the receipt and authentication of which by the transponder means gives rise to a predetermined event, said response signal comprising one or more radio frequency signals of a frequency and duration determined by an algorithm together with a unique stored number with reference to a random number
5 contained in the trigger signal.

In one embodiment of the security system of the invention incorporated into a motor vehicle, the transponder means is adapted to be actuated either by a proximity sensor or by a person touching the vehicle, lifting a door handle or
10 otherwise signalling the transponder means. When an authenticated response signal is received by the transponder means, it causes the vehicle door or doors to become unlocked, in a known manner.

The present invention seeks to avoid unauthorised defeat by varying the communications between the transponder means and the portable electronic device. With present passive access systems as described above, the
15 communication transmissions are of fixed frequencies and in relatively narrow bandwidths. With the present invention, the communication signals can be throughout a relatively broad spectrum of frequencies, such as from 200 MHz to 400 MHz, or even broader. With such a possible bandwidth, it is virtually
20 impossible for a person with a transceiver or similar device to monitor, detect and retransmit the response signal. A person attempting to defeat the system would need to relay the entire 200 MHz band to an accomplice, but the wide bandwidth coupled with the low level of the target signal make implementation extremely unlikely.

25 In one form of the invention, the use of an algorithm with a unique stored number to manipulate the random number contained in the trigger signal means that both the frequency of the response signal and the number and length of

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transmitted pulse trains can be varied. The transponder means is able to tune its receiver to the frequencies of the expected response signal.

In order that the invention is more readily understood, one embodiment will now be described with reference to the accompanying drawings.

5

Description of the drawings

Figure 1 is a schematic view of a vehicle incorporating a security system in accordance with the invention, and

Figure 2 is a block diagram schematically illustrating the features of the
10 invention.

Description of the Preferred Embodiment

Referring to the drawings, in the embodiment illustrated, a proximity sensor 12 is located in a vehicle 14 and senses, in a known manner, the presence
15 of a person adjacent the vehicle 14. The proximity sensor 12 may sense a person touching a vehicle door handle, or sense an attempt to actuate a door handle which activates a switch. Alternatively, the sensor 12 may comprise a short range proximity sensor located in the vehicle using, for example, capacitive monitoring to sense the presence of a person adjacent the vehicle.

20 When the proximity sensor 12 is activated, it causes a vehicle transponder 16 in the vehicle 14 to transmit a radio frequency trigger signal at a predetermined, fixed carrier frequency. This trigger signal includes a random number generated by random number generator 17 associated with the transponder 16. The trigger signal also incorporates coded vehicle identification information that uniquely
25 identifies the vehicle 14. The trigger signal may be transmitted a predetermined number of times, or over a predetermined period, following activation of the proximity sensor. Alternatively, one trigger signal may be transmitted for each

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proximity sensor activation.

The random number generated by the generator 17 is used to establish one or more frequencies to which the transponder receiver 26 in the vehicle is to be tuned to receive a response to the transmitted trigger signal. In this embodiment, the RF frequencies may vary between 200 MHz and 400MHz, although it will be appreciated that a broader or different bandwidth may be used.

At least one electronic identification device 18 is associated with the vehicle transponder 16. The device 18 has receiver and decoder circuitry 19 to receive and decode a received signal, a processor 21 and a transmitter 24. A unique identification number together with vehicle identification information is held in a store 23, and the processor is programmed to conduct calculations in accordance with an algorithm 22.

If the person sensed by the proximity sensor 12 is carrying an electronic identification device 18, the device receives the trigger signal in the receiver and decoder circuitry 19 and determines if the transmitted coded vehicle identification information matches the stored vehicle information in the device. If the received and stored information matches, the random number included with the trigger signal is manipulated in processor 21 using an algorithm 22 and the stored unique number in the store 23. The processor thereby generates a resulting response signal that comprises one or more bursts of RF energy of given duration and at one or more frequencies, the three variables (number of pulses generated, their duration and the RF frequencies of the pulses) being determined by the algorithm working with the unique stored number in conjunction with the random number transmitted from the vehicle 14. The response signal is transmitted by the transmitter 24 and received by a receiver 26 associated with the transponder 16 in the vehicle 14.

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As indicated above, in generating and transmitting the trigger signal, which carries the random number, the receiver 26 in the vehicle is tuned to the frequencies of the expected response signal in accordance with the transmitted random number. On receipt of a response signal of the appropriate frequency or
5 frequencies, a comparator 27 compares the response signal with the expected signal, it being understood that the transponder stores the unique identification number of the device and is able to use the same algorithm to calculate the expected response. If the received response signal matches the expected response, a signal is sent to a door lock actuator 28 to unlock the vehicle
10 door(s).

If vehicle operation authentication is also required of the system, the information exchange described above is repeated when the operator attempts to start the vehicle. In this instance, it is desirable for the system to determine if the identification device 18 is inside the vehicle 14. Accordingly, the power of
15 the trigger signal transmitted by the transponder for this function is controlled so that it is unlikely that the identification device 18 could detect the signal from outside the vehicle. This ensures that the vehicle cannot be operated unless the identification device is within the vehicle. If desired, the system may be designed such that the identification device must be mounted in an appropriate
20 receptacle in the vehicle before the vehicle is able to be started.

It will be appreciated that the security system of the described embodiment is more secure than the previous systems of a similar type as described herein by reason of the use of a variable signal frequency within a wide bandwidth for the response signal. Further, by using an algorithm together
25 with an unique identification number to manipulate the transmitted random number and generate a response signal having at least three variables, viz, the number of pulses, the duration of the pulses and the RF frequencies of the

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individual pulses, it will be very difficult to attack the system by the use of normal, portable transceivers.

It will be appreciated that the response signal may also include other variables, such as a polling identification number, the polling of which is
5 determined by the random number.

A security system of the invention may be made substantially more immune to interfering external RF sources than currently known systems by the use of the variable frequency of the response signal. If access to a vehicle is blocked because of an interfering RF signal source, re-activation of the trigger
10 signal will generally give rise to a response signal having a frequency that is not interfered with by the RF source. However, some redundancy should be made in the identification device's response coding to allow for masking which may occur due to interfering external signals at spot frequencies.

It will be appreciated that the principals of this invention may be used in
15 a large number of different applications, such as security access associated with buildings, including external doors, internal doors, lifts, maintenance areas and the like. The principals may also be used to provide authorisation for activities other than access. Thus, the system may be designed to permit only authorised use of equipment

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CLAIMS:

1. A security system having transponder means adapted to be actuated to generate and transmit an electromagnetic trigger signal, and a portable
5 electronic device adapted to receive and respond to said trigger signal by transmitting a response signal, the receipt and authentication of which by the transponder means gives rise to a predetermined event, said response signal comprising one or more radio frequency signals of a frequency and duration determined by an algorithm together with a unique number stored in the device
10 and with reference to a random number contained in the trigger signal.
2. A security system according to claim 1 wherein said response signal contains three variables comprising the number of pluses in the RF signal, the frequency of the pulses and the pulse duration.
15
3. A security system according to claim 1 or claim 2 wherein the transponder means includes a receiver which is tuned to the expected frequency of the response signal in accordance with the random number contained in the trigger signal.
20
4. A security system according to any one of claims 1 to 3 wherein the transponder means is actuated by a proximity sensor.
5. A security system according to any one of claims 1 to 3 wherein the
25 transponder means is actuated by a switch.
6. A security system according to any one of the preceding claims wherein

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the predetermined event is the actuation of a door lock or the enabling of a control system.

7. A security system according to any one of the preceding claims wherein
5 a random number generator is associated with the transponder means and generates a new random number upon each actuation of the transponder means.

8. A security system according to any one of the preceding claims wherein
10 the transponder means transmits the trigger signal for a predetermined period following actuation or until reception of an authenticated response signal.

9. A security system according to any one of the preceding claims wherein
said trigger signal incorporates coded identification information that uniquely
15 identifies the transponder

10. A security system according to claim 9 wherein the device stores
identification information and on reception of a trigger signal, determines if the
transmitted coded identification information match the stored information and
generates a response signal only if the information matches.

20

11. A security system according to any one of the preceding claims wherein
the frequency of the response signal varies with each transmission within the
range 200 MHz and 400 MHz.

25 12. A security system according to any one of the preceding claims wherein
the frequency of individual pulses of the response signal vary within a
predetermined range.

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13. A security system according to any one of the preceding claims wherein said transponder means is mounted in a motor vehicle and is actuated by a proximity sensor or a switch associated with a vehicle door handle.

5

14. A security system according to claim 13 wherein the or a second transponder means is associated with vehicle electrical circuits which are enabled on receipt of an authenticated response signal following transmission of a coded trigger signal initiated by vehicle starting procedures.

10

15. A security system according to claim 14 wherein the signal strength of the coded trigger signal transmitted on actuation of vehicle starting procedures is such that the signal is unable to be detected by the device outside the vehicle.

15

16. A security system according to any one of claims 13 to 15 wherein the vehicle includes a receptacle with which the device must be engaged before vehicle electrical systems are able to be enabled.

20

17. A security system substantially as hereinbefore described with reference to the accompanying drawings.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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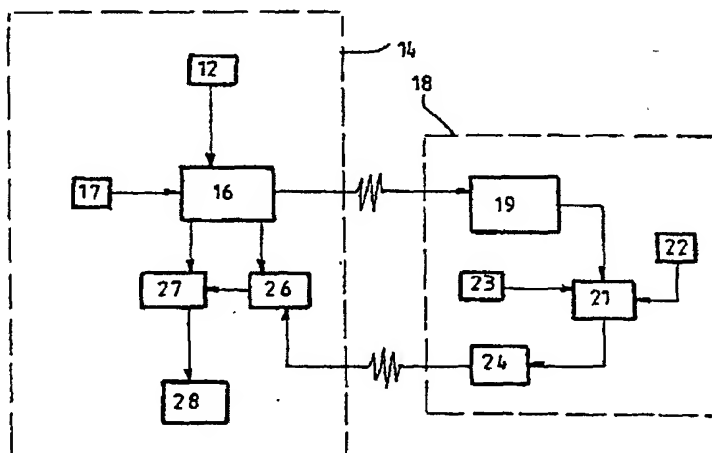
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(Continued on next page)

(54) Title: IMPROVED SECURITY SYSTEM



(57) Abstract: A security system suitable for a vehicle (14) has a transponder (16) and a remote, portable device (18). The transponder (16) is associated with a random number generator (17) and incorporates a signal receiver (26) and a comparator (27). On actuation, the transponder generates a trigger signal which includes vehicle identification information and a random number. The portable device (18) receives and decodes the trigger signal and responds with a response signal which comprises one or more RF signals of a frequency and duration calculated by the device using a stored algorithm and a unique number in conjunction with the transmitted random number in the trigger signal. The frequency of the response signal is therefore varied until each different random number, and the receiver in the transponder is tuned to the expected response signal frequency.

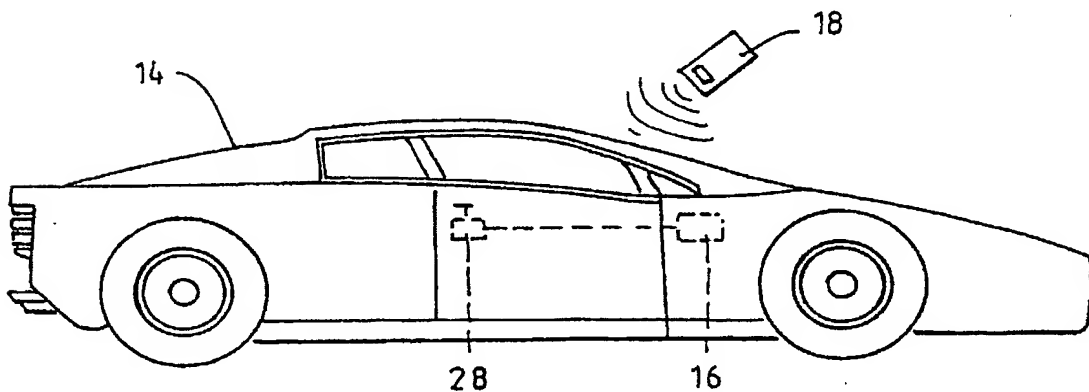
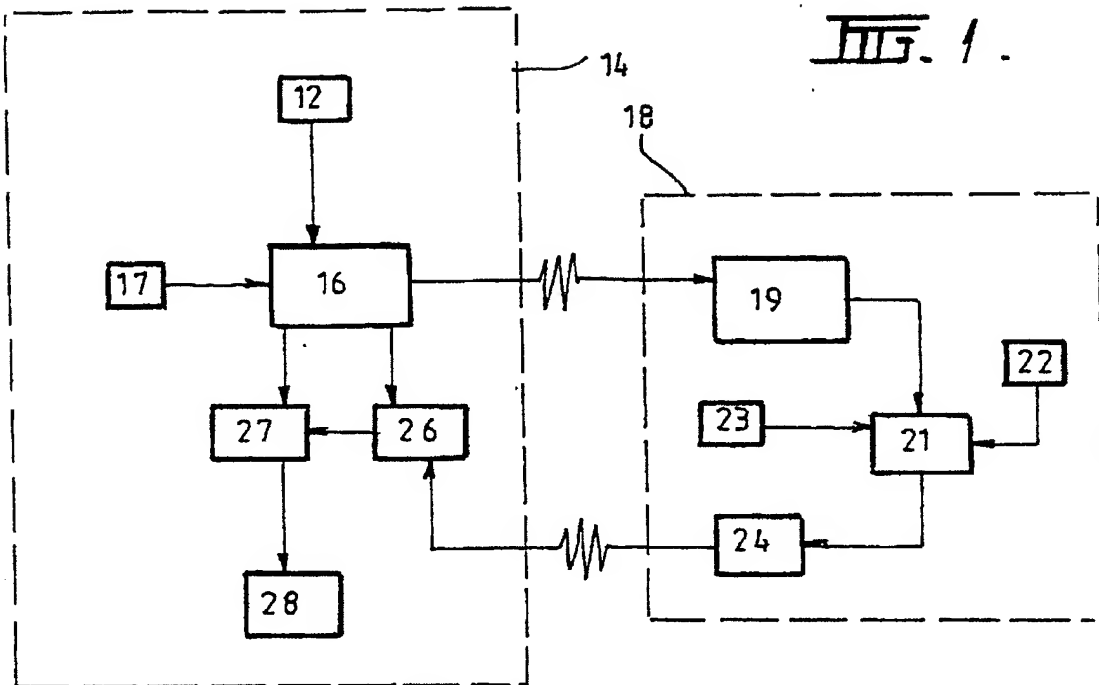
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**COMBINED DECLARATION AND POWER OF ATTORNEY
IN PATENT APPLICATION**

Attorney Docket No: CASM1 - 18912

As a below-named inventor, I hereby declare that:

my residence, post office address and citizenship are as stated below next to my name;

I believe that I am the original, first and joint inventor of the subject matter that is claimed and for which patent is sought on the invention entitled: **IMPROVED SECURITY SYSTEM**

(check only one item below):

_____ was executed on _____ and is attached hereto.

 X we authorize our attorneys of the firm of Christensen O'Connor Johnson & Kindness, 1420 Fifth Avenue, Suite 2800, Seattle, Washington 98101, to insert here in parentheses (was filed as United States application Serial No. 10/089,793, on March 28, 2002) the application number and filing date of said application.

_____ was filed as United States application Serial No. _____ on _____.

 X was filed as PCT international application No. PCT/AU00/01186 on 28 September 2000, and was amended under _____ on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with 37 C.F.R. 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below, and I have also identified below any foreign application for patent or inventor's certificate, or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application No(s).	Country	Foreign Filing Date Month/Day/Year	Priority Claimed Yes/No Yes
PQ3123	Australia	09/28/1999	Yes

I hereby appoint the following attorneys and/or agents to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith: Bruce E. O'Connor, Reg. No. 24,849; Lee E. Johnson, Reg. No. 22,946; Gary S. Kindness, Reg. No. 22,178; James W. Anable, Reg. No. 26,827; James R. Uhlir, Reg. No. 25,096; Jerald E. Nagae, Reg. No. 29,418; Dennis K. Shelton, Reg. No. 26,997; Jeffrey M. Sakoi, Reg. No. 32,059; Ward Brown, Reg. No. 28,400; Robert J. Carlson, Reg. No. 35,472; Rodney C. Tullett, Reg. No. 34,034; Daiva K. Tautvydas, Reg. No. 36,077; Mary L. Culic, Reg. No. 40,574; Julie C. VanDerZanden, Reg. No. 38,105; George E. Renzoni, Ph.D., Reg. No. 37,919; Philip P. Mann, Reg. No. 30,960; George S. Farber, Reg. No. 41,497; Kevan L. Morgan, Reg. No. 42,015; John D. Denkenberger, Reg. No. 44,060; and the firm of Christensen O'Connor Johnson Kindness^{PLLC}. Address all telephone calls to 206.682-8100.

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I hereby further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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